## Space Weather Forecast

Issued on Monday, 16 September 2024 at 00:25 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Chance of Moderate flares. G1-G2/Minor-Moderate Geomagnetic storms expected 16 Sep, with a chance of G3/Strong storm intervals and slight chance of peak G4/Severe storm conditions due to a forecast fast coronal mass ejection arrival.**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity**: Low with only common class flares observed. There are seven sunspot regions on the disc with the most active in the southeast with an X4.5 flare observed at 14/1529 UTC, although more recent flare activity has decreased. It is a compact region, now showing a reducing trend in both areal extent and magnetic complexity. The spot near centre disk continues with some weak spot/pore proliferation in the intermediate and trailing part of the group, including a single small spot of negative polarity, surrounded by a positive polarity region. A new moderately sized or large spot is emerging around the southeast limb, currently appearing as a simple region, though may increase in complexity when it rotates clearly into view. The remaining regions are small, with limited magnetic complexity.

No Earth-directed coronal mass ejections have been observed.

**Solar Wind / Geomagnetic Activity:** Solar wind parameters were slightly enhanced during the period, with wind speeds gradually decreasing from elevated to slightly elevated. The Interplanetary Magnetic Field (IMF) was steady, and mostly Weak to Moderate, while the north-south component was erratic, but often negative. The net result of these parameters was for Quiet to Active geomagnetic activity (Kp 2-4).

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) has risen since the strong flare on 14 Sep but remains below the S1/Minor Storm threshold at this time.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Low to Moderate activity is forecast, with a chance of Moderate class flares, most likely from the previously active region in the southeast.

**Solar Wind / Geomagnetic Activity:** There are up to two coronal mass ejection arrivals and up to two coronal hole fast winds which feature in the forecast. The most significant feature is the 14 Sep coronal mass ejection which may bring Strong or Very Strong solar winds at Earth on day 1 (16 Sep). This feature may have lingering effects into day 2 (17 Sep) combined with the first coronal hole fast wind. A second coronal hole fast wind may arrive day 3 or 4 (18 or 19 Sep), with slightly elevated to elevated speeds possible.

Generally Quiet to Active geomagnetic activity is expected initially. The 14 Sep coronal mass ejection should arrive by midday on day 1 (16 Sep) with G1-G2/Minor-Moderate storming expected, but a chance of peak G3/Strong storm levels and a slight chance of G4/Severe storm intervals occurring. These risks reduce into days 2 and 3 (17 and 18 Sep) due to waning CME and coronal hole fast wind effects.

**Aurora:** Auroral activity is expected to peak on Monday (16 Sep), following the anticipated

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arrival of the fast CME that left the Sun on 14 Sep (Saturday). This is forecast to bring aurora visible to the naked eye across Scotland, Northern Ireland and perhaps parts of England and Wales, although peak geomagnetic and auroral activity is expected to occur during daylight hours on Monday. Lingering effects may then continue into the following night, once again with aurora sightings likely across Scotland and perhaps Northern Ireland and parts of Northern England on Tuesday.

**Energetic Particles / Solar Radiation:** The count rate of energetic particles (high energy protons) has risen after the Strong flare on 14 Sep, but remains below the S1/Minor Storm threshold. There is still a chance that S1 proton storm levels may be reached day 1 (16 Sep), this risk reducing later in the period.

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**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 80 | 60 | 20 | 20 |
| Strong | G3 | No | 45 | 20 | 1 | 1 |
| Severe | G4 | No | 15 | 5 | 1 | 1 |
| Extreme | G5 | No | 5 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | Yes | 40 | 40 | 40 | 40 |
| Very Active | R3 to R5 X | Yes | 10 | 10 | 10 | 10 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 30 | 20 | 10 | 10 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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